Claims

We Claim:

1. An electrical substrate for use as a carrier of biomolecules in a method for electrochemical detection in an electrolyte solution, having
   an insulating support plate (12) that bears a conductive pattern (20; 20A-20C, 28) having conductor paths (20; 20A-20C) and connecting contact surfaces, and having
   disposed on the conductor paths (20; 20A-20C) test sites (24) for the application of biomolecules (26),
   the conductor paths (20; 20A-20C) exhibiting a metal core (14) made of a highly conductive base metal and a gold layer surrounding the metal core (18), and the conductor paths (20; 20A-20C) being continuously provided with a diffusion barrier layer (16) that prevents direct contact of the electrolyte solution with the metal core (14) during the electrochemical detection method.

2. The electrical substrate according to claim 1, characterized in that the metal core (14) comprises copper, tungsten and/or aluminum.

3. The electrical substrate according to claim 1 or 2, characterized in that the metal core (14) is formed of copper.

4. The electrical substrate according to one of the preceding claims, characterized in that the diffusion barrier layer comprises an interlayer (16) made of nickel, titanium and/or platinum disposed between the metal core (14) and the external gold layer (18).

5. The electrical substrate according to claim 4, characterized in that the interlayer (16) exhibits a thickness of about 2 µm to about 10 µm, preferably of about 3 µm to about 8 µm, particularly preferably of about 4 µm to about 6 µm.

6. The electrical substrate according to one of the preceding claims, characterized in that the diffusion barrier layer comprises a lacquer layer applied to the gold layer (18).

7. The electrical substrate according to one of the preceding claims, characterized in that the diffusion barrier layer comprises, disposed on the metal core, a gold layer (18) whose pores are substantially closed by the incipient melting of a surface region (26) of the gold layer (18).

8. The electrical substrate according to one of the preceding claims, characterized in that the gold layer (18) exhibits a thickness of about 0.15 μm to about 10 μm, preferably of about 1 μm to about 5 μm, particularly preferably of about 2 μm to about 3 μm.

9. The electrical substrate according to one of the preceding claims, characterized in that the diffusion barrier layer is formed by a gold layer that is disposed on the metal core and whose thickness is chosen to be so large that it prevents direct contact of the electrolyte solution with the metal core (14).

10. The electrical substrate according to one of the preceding claims, characterized in that the insulating support plate (12) is a single-sided rigid support plate, a double-sided rigid support plate or a rigid multilayer support plate.

11. The electrical substrate according to one of claims 1 to 9, characterized in that the insulating support plate (12) is a single-sided or double-sided flexible support plate, especially made of a polyimide film, or a rigid-flexible support plate.

12. The electrical substrate according to one of the preceding claims, characterized in that the insulating support plate (12) is composed of a base material selected from the group: bismaleimide triazine resin with silica glass (BT), cyanate ester with silica glass (CE), hard paper core with FR4 outer layers (CEM1), fiberglass mat core with FR4 outer layers (CEM3), phenolic resin paper (FR2), hard paper (FR3), epoxide woven glass fabric (FR4), epoxide woven glass fabric with a cross-linked resin system (FR5), polyimide resin with aramide reinforcement (PD), polytetrafluoroethylene with glass or ceramic (PTFE), highly cross-linked hydrocarbons with ceramic (CHn) and glass.

13. The electrical substrate according to one of claims 1 to 11, characterized in that the insulating support plate (12) is formed by a semiconductor plate or a semiconductor plate provided with a support plate insulation layer.

14. The electrical substrate according to claim 13, characterized in that the insulating support plate (12) is formed by a silicon plate provided with a with a SiN_x insulating layer.

15. The electrical substrate according to one of the preceding claims, characterized in that the conductor paths (20) exhibit a width of 50 μm to 250 μm, especially of 80 μm to 200 μm.

16. The electrical substrate according to one of the preceding claims, characterized in that an insulation layer (22) is applied to the gold layer (18) in sub-regions.

17. The electrical substrate according to claim 16, characterized in that the insulation layer (22) is formed by a thermally and/or optically curable, structurable lacquer.

18. The electrical substrate according to claim 16 or 17, characterized in that the insulation layer (22) is formed by a parylene layer.

19. The electrical substrate according to one of claims 16 to 18, characterized in that the insulation layer (22) exhibits a thickness of about 1 μm to about 30 μm, preferably of about 5 μm to about 20 μm.

20. The electrical substrate according to one of claims 16 to 19, characterized in that the insulation layer (22) on a portion of the conductor paths (20) exhibits voids (24) that reach to the underlying gold layer (18) and that form test sites for the application of the biomolecules (26).

21. The electrical substrate according to one of the preceding claims, characterized in that the conductive pattern includes one or more vias that exhibit, disposed at their circumferential edge surface, a metal core made of a highly conductive base metal, and a gold layer surrounding the metal core, and the vias being continuously provided with a diffusion barrier layer that prevents direct contact of the electrolyte solution with the metal core during the electrochemical detection method.

22. The electrical substrate according to claim 21, characterized in that the metal core of the vias is formed of tungsten or aluminum.

23. The electrical substrate according to one of claims 21 or 22, characterized in that the diffusion barrier layer is formed by an interlayer made of nickel, titanium and/or platinum disposed between the metal core of the vias and the external gold layer.

24. The electrical substrate according to claim 23, characterized in that the interlayer of the vias exhibits a thickness of about 0.01 µm to about 1 µm, preferably of about 0.05 µm to about 0.5 µm, particularly preferably of about 0.1 µm to about 0.2 µm.

25. The electrical substrate according to one of claims 21 to 24, characterized in that the gold layer of the vias exhibits a thickness of about 0.05 µm to about 0.75 µm, preferably of about 0.15 µm to about 0.5 µm, particularly preferably of about 0.3 µm.

26. A use of an electrical substrate according to one of the preceding claims in an electrochemical detection method selected from the group: chronoamperometry (CA), chronocoulometry (CC), linear sweep voltammetry (LSV), cyclic voltammetry (CSV), AC voltammetry, voltammetry techniques with various pulse shapes, especially square wave voltammetry (SWV), differential pulse voltammetry (DPV), or normal pulse voltammetry (NPV), AC or DC impedance spectroscopy, chronopotentiometry and cyclic chronopotentiometry.